Linear Transformer Drivers for Z-pinch Based Propulsion

Robert Adams[1], William Seidler[2], Patrick Giddens[2], Leo Fabisinski[1], Jason Cassibry[2]

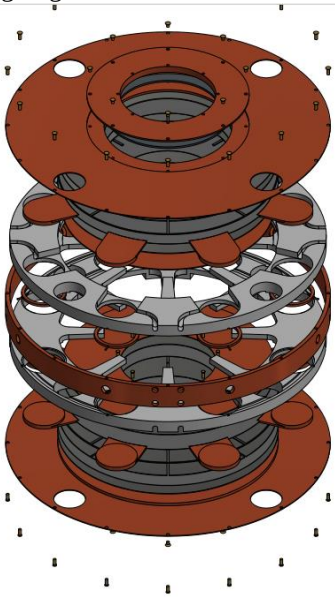
[1] *National Aeronautics and Space Administration, MSFC, AL, USA*
[2] *University of Alabama in Huntsville, Huntsville, AL, USA*

Abstract:

The MSFC/UAH team has been developing of a novel power management and distribution system called a Linear Transformer Driver (LTD). LTD's hold the promise of dramatically reducing the required mass to drive a z-pinch by replacing the capacitor banks which constitute half the mass of the entire system. The MSFC?UAH tea, is developing this technology in hope of integrating it with the Pulsed Fission Fusion (PuFF) propulsion concept.

High-Voltage pulsed power systems used for Z-Pinch experimentation have in the past largely been based on Marx Generators. Marx generators deliver the voltage and current required for the Z-Pinch, but suffer from two significant drawbacks when applied to a flight system: they are very massive, consisting of high-voltage capacitor banks insulated in oil-filled tanks and they do not lend themselves to rapid pulsing.

The overall goals of Phase 1 are to demonstrate the feasibility of the LTD concept for a Z-Pinch propulsion system and to learn techniques for designing them. The Phase 1 focus is on the development of a single demonstration cavity, built largely from off-the-shelf components, which is capable of inducing a < 100ns, 4 J pulse in its output line at least 10 times per second.



The overall goal of Phase 2 is to demonstrate the construction of a higher voltage stack from a number of cavities each of the design proven in Phase 1 and to characterize and understand the techniques for designing the stack.
The overall goal of Phase 3 is to demonstrate the feasibility of constructing a higher energy cavity from a number of smaller LTD stacks, to characterize and understand the way in which the constituent stacks combine, and to extend this demonstration LTD to serve as the basis for a 64 kJ pulse generator for Z-Pinch experiments.

(Check one of the following)

X Oral Session

☐ Poster Session